Härryda – Self-healing grid

Participants: Härryda energi, Protrol
Category: Distribution management
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Location: Härryda
Possible to visit: Yes

Background

Härryda energi aims to be a forerunner when it comes to smart grids, and one of their projects is a so-called self-healing grid. The technology is tested in an open 10 kV network loop, where there are seven network stations with cable sections between them. In each network station, there is equipment that monitors the cable, and automatically can re-route the power flow if there is a cable fault.

Implementation of the project

In order to accomplish this functionality, new monitoring equipment has been installed, that is able to detect faults with a higher degree of precision. Also, the power equipment needed to be upgraded, such as replacing load switches with circuit breakers. To accomplish "light automation", which means that a fault should be rectified in about 0,2 seconds, there was also a need for new communications equipment. Fibre is installed along the entire loop, which means that the signals will travel quickly between the network stations and allow for quick re-routing.

Since the equipment was installed, there has not been any cable faults in the loop, which means that it is hard to draw any definite conclusions. Identical fault detection instrumentation has been installed in other parts of the network and proved successful. These installations, however, do not include the equipment that gives the grid self-healing properties, but only indicates that there is a fault. In order to test the ability of the self-healing function, there is a possibility that a test will be carried out, where a cable fault is simulated in the relevant loop.

Benefits

The self-healing grid has a substantial potential to cut downtime in power grids. Even if there are cost considerations to be made when installing more advanced equipment, the installation should be relatively straightforward. While the installation in Härryda uses "light automation", there is maybe even more potential for the "dark automation", where fibre is not used for communication. This is however another project. "Light automation" is better equipped when new cables are installed, and fibre can be put into the ground at the same time. Härryda energi has opted to use modern equipment and technology throughout their network, which makes sure that operation is running smooth. As the components in themselves are reasonably standard, it should be possible to install them in present networks.

The main benefit of the system is a shortened downtime when there is a cable fault. With the common network topology, a cable fault would typically be expected to leave the customers without electricity for a couple of hours. With this particular solution, this would for most customers be resolved in about 0,2 seconds.

Scalability

The installation is straightforward to implement at a larger scale. Possible obstacles are economical rather than technical.

Interoperability

While there could be some interoperability problems with older components in the grid, this should not be a limiting factor. It is likely that the system is more cost-effective to install when new cables are constructed than with older infrastructure.

Investment horizon

The investment for a system like this is largely dependent on factors such as if it is a new installation or if it is an upgrade of an older loop. The components are more expensive than the ones usually used, but the reduction in downtime could make up for this and make the investment feasible.

International potential

This kind of self-healing grids has a large potential to be used internationally, as it can reduce downtimes in almost any grid, no matter the exact topology.